

N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON) \text{ max}}$ | $I_D \text{ max}$ $T_A = +25^\circ\text{C}$ |
|---------------|--------------------------------|--|
| 20V | 72mΩ @ $V_{GS} = 4.5\text{V}$ | 3.4A |
| | 110mΩ @ $V_{GS} = 2.5\text{V}$ | 2.7A |

Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **ESD protected gate**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

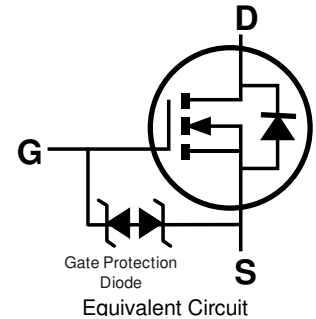
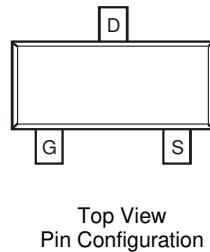
Description and Applications

This MOSFET is designed to minimize the on-state resistance ($R_{DS(on)}$) and yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

- Battery Charging
- Power Management Functions
- DC-DC Converters
- Portable Power Adaptors

Mechanical Data

- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (3)
- Terminals Connections: See Diagram Below
- Weight: 0.008 grams (Approximate)

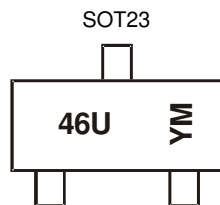


Ordering Information (Note 4)

| Part Number | Case | Packaging |
|-------------|-------|--------------------|
| DMN2046U-7 | SOT23 | 3,000/Tape & Reel |
| DMN2046U-13 | SOT23 | 10,000/Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



46U = Product Type Marking Code
 YM = Date Code Marking
 Y or \bar{Y} = Year (ex: B = 2014)
 M = Month (ex: 9 = September)

Date Code Key

| Year | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|------|------|------|------|------|------|------|------|------|
| Code | B | C | D | E | F | G | H | I |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | O | N | D |

Maximum Ratings (@ $T_A = +25^\circ\text{C}$ unless otherwise specified.)

| Characteristic | | | Symbol | Value | Units |
|--|--------------|---------------------------|-----------|----------|-------|
| Drain-Source Voltage | | | V_{DSS} | 20 | V |
| Gate-Source Voltage | | | V_{GSS} | ± 12 | V |
| Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$ | Steady State | $T_A = +25^\circ\text{C}$ | I_D | 3.4 | A |
| | | $T_A = +70^\circ\text{C}$ | | 2.7 | |
| Pulsed Drain Current (Pulse width $\leq 10\mu\text{s}$, Duty Cycle $\leq 1\%$) | | | I_{DM} | 18 | A |

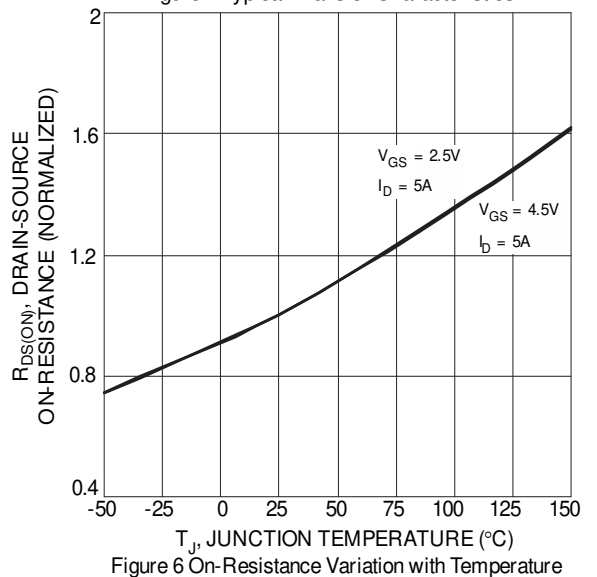
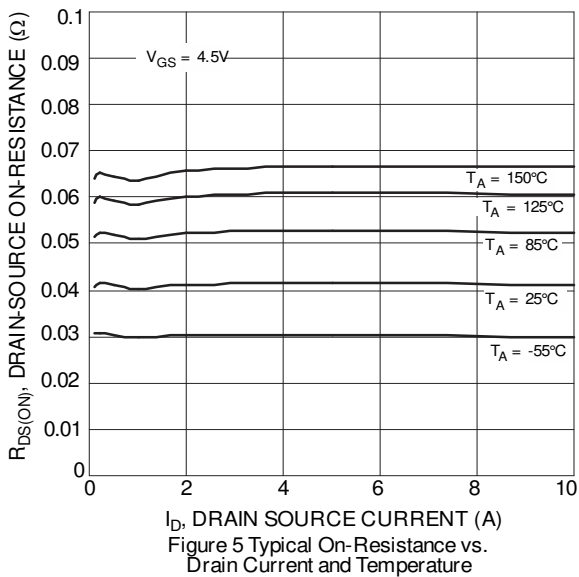
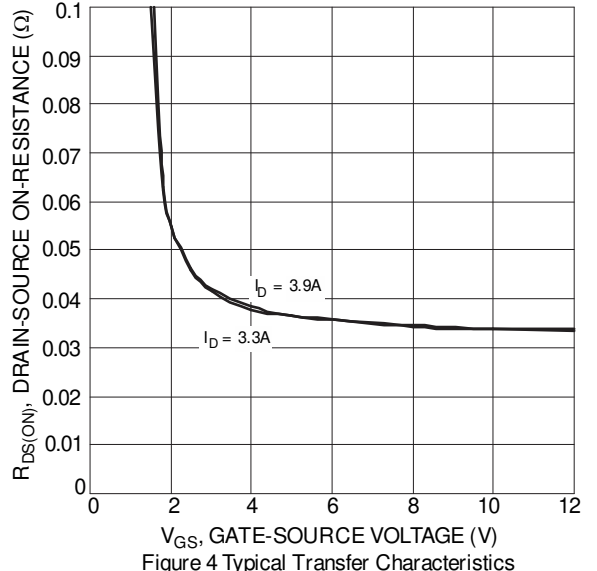
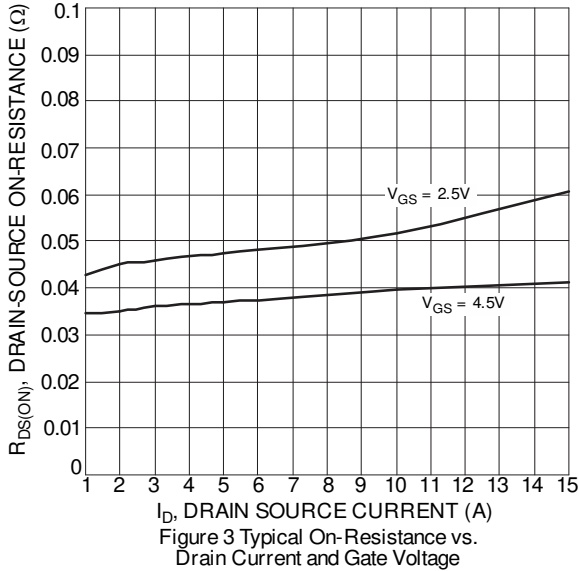
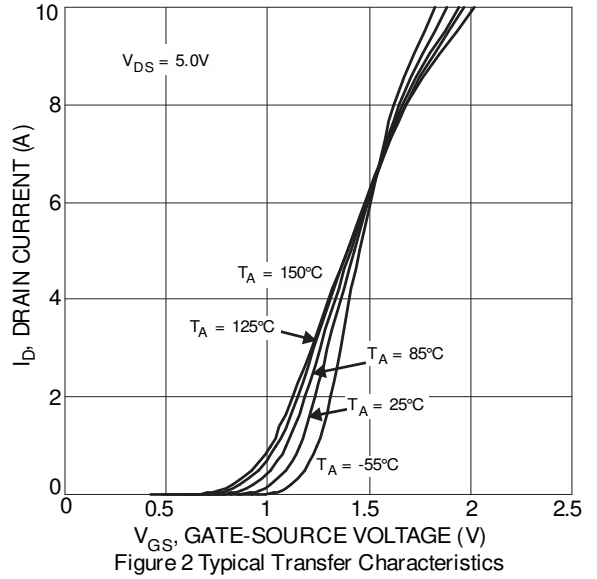
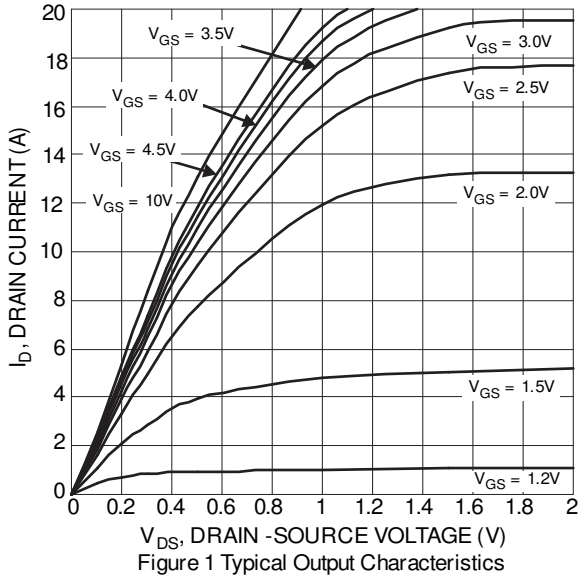
Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|--|-----------------|-------------|--------------------|
| Power Dissipation (Note 5) | P_D | 0.76 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | 166 | $^\circ\text{C/W}$ |
| Power Dissipation (Note 6) | P_D | 1.26 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | 100 | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |

Electrical Characteristics @ $T_A = +25^\circ\text{C}$ unless otherwise specified

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|--------------|-----|------|----------|---------------|---|
| OFF CHARACTERISTICS (Note 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | 20 | - | - | V | $V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$ |
| Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$ | I_{DSS} | - | - | 1.0 | μA | $V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$ |
| Gate-Source Leakage | I_{GSS} | - | - | ± 10 | μA | $V_{GS} = \pm 10\text{V}, V_{DS} = 0\text{V}$ |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | 0.4 | - | 1.4 | V | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ |
| Static Drain-Source On-Resistance | $R_{DS(on)}$ | - | - | 72 | m Ω | $V_{GS} = 4.5\text{V}, I_D = 3.6\text{A}$ |
| | | | | 110 | | $V_{GS} = 2.5\text{V}, I_D = 3.1\text{A}$ |
| Diode Forward Voltage | V_{SD} | - | - | 1.2 | V | $V_{GS} = 0\text{V}, I_S = 0.94\text{A}$ |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C_{iss} | - | 292 | - | pF | $V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$ |
| Output Capacitance | C_{oss} | - | 36 | - | pF | |
| Reverse Transfer Capacitance | C_{rss} | - | 32 | - | pF | |
| Gate Resistance | R_g | - | 63 | - | Ω | $V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ |
| Total Gate Charge | Q_g | - | 3.8 | - | nC | $V_{GS} = 4.5\text{V}, V_{DS} = 10\text{V}, I_D = 5.1\text{A}$ |
| Gate-Source Charge | Q_{gs} | - | 0.5 | - | nC | |
| Gate-Drain Charge | Q_{gd} | - | 0.8 | - | nC | |
| Turn-On Delay Time | $t_{D(on)}$ | - | 6.7 | - | ns | $V_{DD} = 10\text{V}, V_{GS} = 4.5\text{V}, R_L = 2.4\Omega, R_G = 6\Omega$ |
| Turn-On Rise Time | t_r | - | 25.1 | - | ns | |
| Turn-Off Delay Time | $t_{D(off)}$ | - | 69.1 | - | ns | |
| Turn-Off Fall Time | t_f | - | 34.1 | - | ns | |
| Reverse Recovery Time | t_{rr} | - | 18.2 | - | ns | |
| Reverse Recovery Charge | Q_{rr} | - | 3.6 | - | nC | $I_F = 4.1\text{A}, di/dt = 100\text{A}/\mu\text{s}$ |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to production testing.



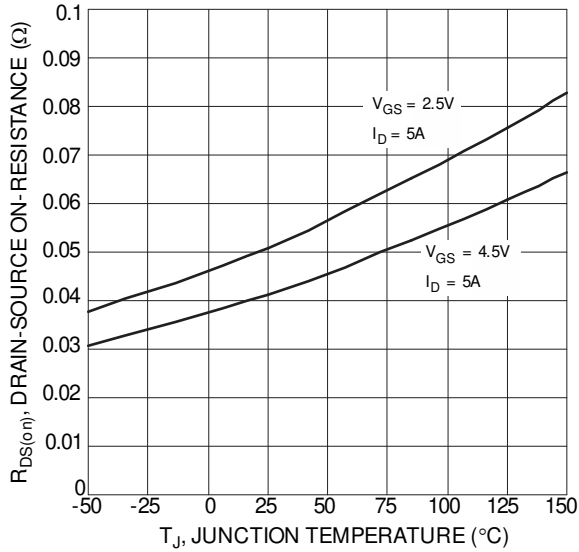


Figure 7 On-Resistance Variation with Temperature

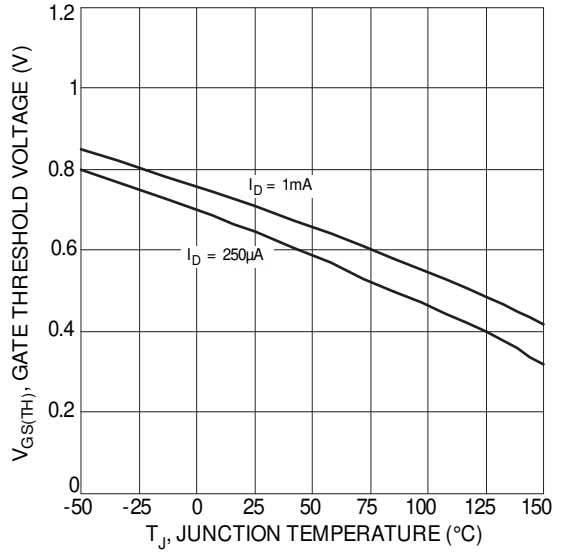


Figure 8 Gate Threshold Variation vs. Ambient Temperature

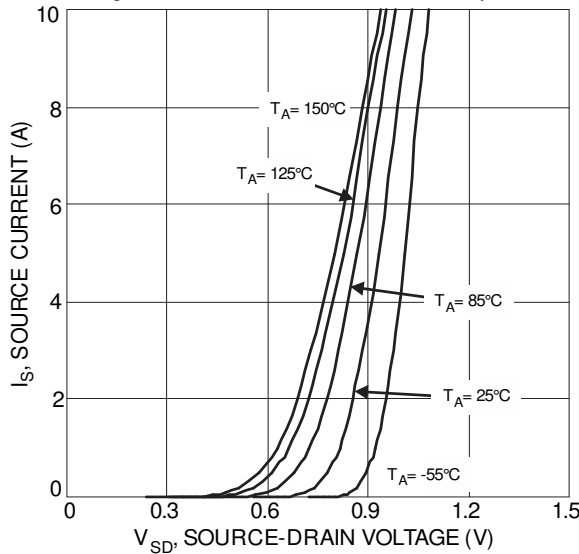


Figure 9 Diode Forward Voltage vs. Current

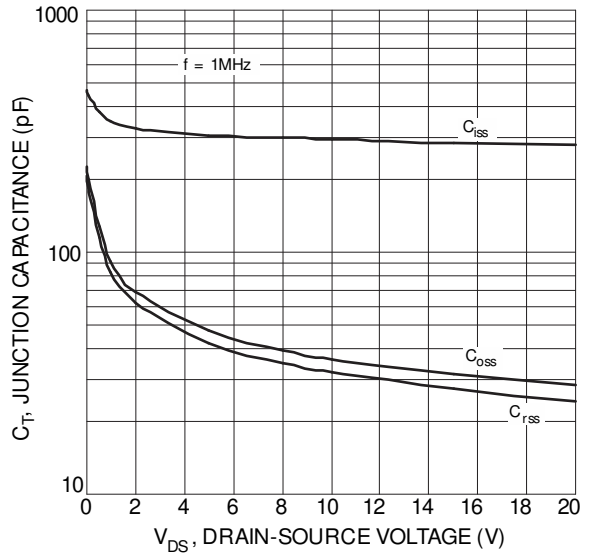


Figure 10 Typical Junction Capacitance

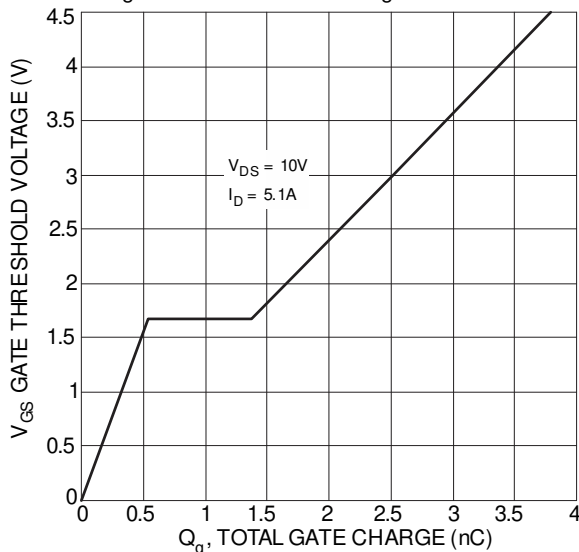


Figure 11 Gate Charge

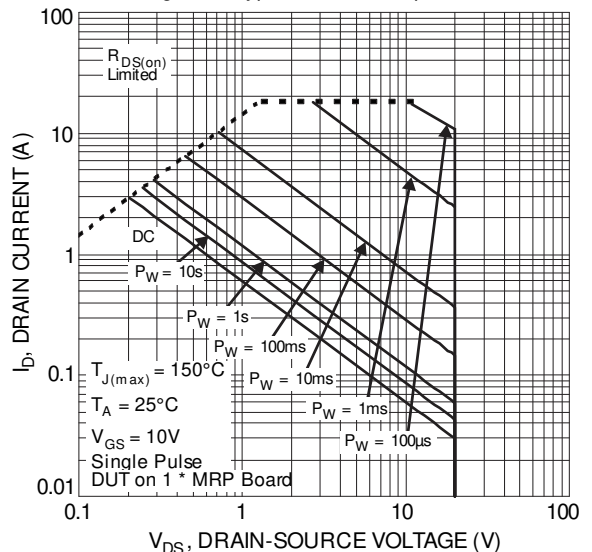
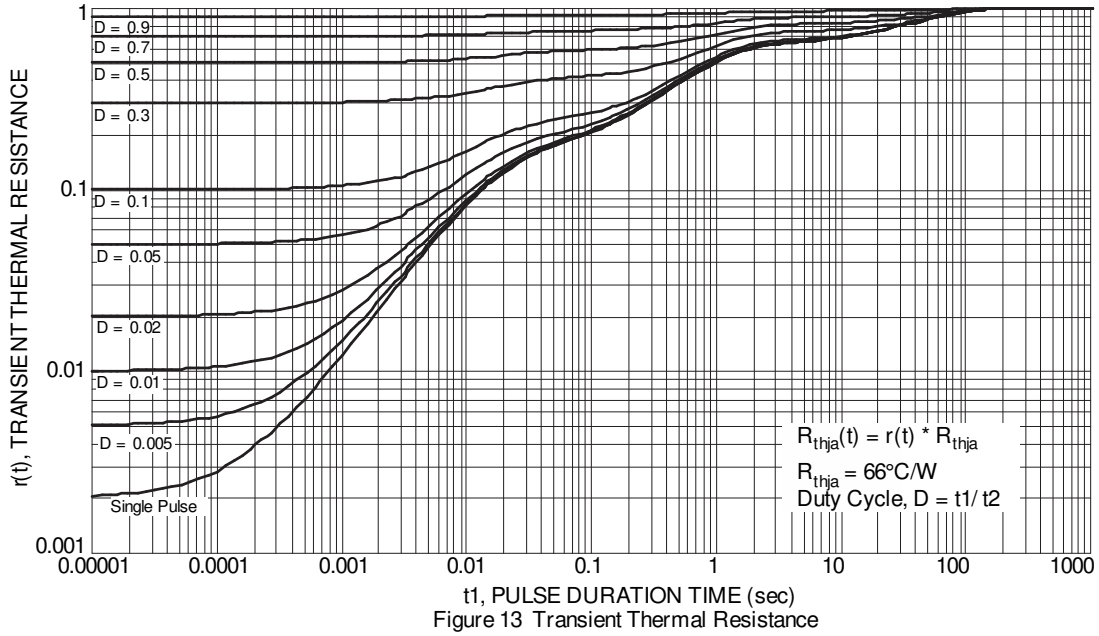
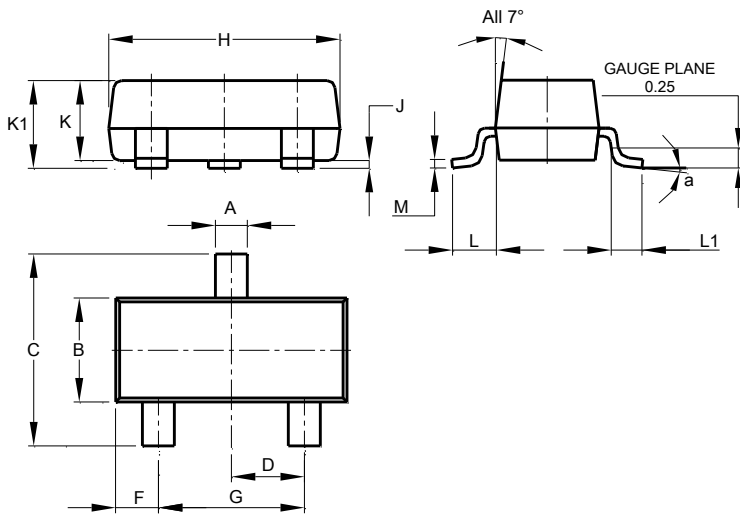


Figure 12 SOA, Safe Operation Area



Package Outline Dimensions

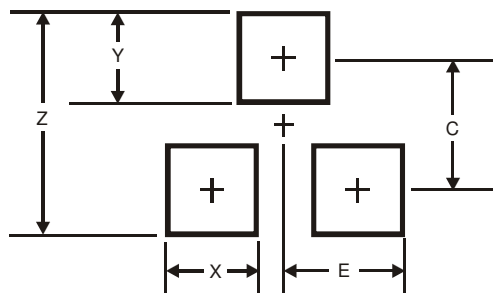
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



| SOT23 | | | |
|----------------------|-------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.37 | 0.51 | 0.40 |
| B | 1.20 | 1.40 | 1.30 |
| C | 2.30 | 2.50 | 2.40 |
| D | 0.89 | 1.03 | 0.915 |
| F | 0.45 | 0.60 | 0.535 |
| G | 1.78 | 2.05 | 1.83 |
| H | 2.80 | 3.00 | 2.90 |
| J | 0.013 | 0.10 | 0.05 |
| K | 0.890 | 1.00 | 0.975 |
| K1 | 0.903 | 1.10 | 1.025 |
| L | 0.45 | 0.61 | 0.55 |
| L1 | 0.25 | 0.55 | 0.40 |
| M | 0.085 | 0.150 | 0.110 |
| a | 8° | | |
| All Dimensions in mm | | | |

Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| Z | 2.9 |
| X | 0.8 |
| Y | 0.9 |
| C | 2.0 |
| E | 1.35 |

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